521 M7280 – SATELLITE GEODESY

SPRING SEMESTER 2017

Lab No. 6

handed out Wednesday, April 19, 2017
due Wednesday, April 26, 2017, 09:10 **Name:** _____

Satellite Orbit in 3-D Space (I) Reading a SP3 file

1. From a GPS orbit final solution (in a sp3 format), please write a Matlab program which retrieves the satellite's (satellite ID = your date of birth) positions every 15 min for a 48-hour period.

   a. List your results in both an initial frame and ECEF Cartesian frame with 7 columns (time, Xin, Yin, Zin, x, y, z).
   b. Plot the satellite's position in two 3-D maps (one for inertial and the other for ECEF Cartesian).
   c. Which GPS sp3 file do you use?

2. Convert your ECEF Cartesian coordinates into the ECEF spherical frame.

   a. List the results in a table with 4 columns (time, longitude, latitude, height).
   b. Plot in a 2-D map for the longitude, latitude, and height values as functions of time.

3. Discuss your results.

Note:
The GPS sp3 files are available from IGS or NGS websites. Use only the latest final orbits.
IGS: http://igscb.jpl.nasa.gov/components/dcnav/sopac_products.html
NGS: http://www.ngs.noaa.gov/orbits

Use for $\boldsymbol{GM} = 398600.4418\left(\mathrm{km}^3/\mathrm{s}^2\right)$, $\omega_e^* = 7292115.8553\times10^{-11}\left(\mathrm{rad/s}\right)$, $\omega_e = 7292115\times10^{-11}\left(\mathrm{rad/s}\right)$, and $\boldsymbol{R} = 6371.000000\left(\mathrm{km}\right)$.

Your (individual) final report should contain (use A4 papers):

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (% .....)
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results